REMARKS

This responds to the Office Action mailed on October 20, 2005, and the references cited therewith. Claims 1, 6, 8 and 12-14 are amended, claims 17-32 are withdrawn, no claims are canceled, and no claims are added; as a result, claims 1-16 are now pending in this application.

§112 Rejection of the Claims

Claims 1 and 12 were rejected under 35 U.S.C. § 112, as there is insufficient antecedent basis for this limitation in the claims.

Applicants have amended claims 1 and 12 to address this rejection, as indicated above. Reconsideration is respectfully requested.

§101 Rejection of the Claims

Claims 1 and 12 were rejected under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter. Specifically, the Office Action stated that Applicant's method invention of improving the cache behavior is directed to a non-statutory abstract idea since the steps ("associating with each node ... node"; "representing ... MBR"; and "compressing ... quantization") are broadly recited without regard to any tangible way of implementing them (Office Action, pp. 2-3).

Applicants, however, respectfully disagree with the Office Action since claims 1 and 12 are directed to methods comprising steps instantiated into some physical implementation which would result in a practical application producing a concrete, useful, and tangible result.

Applicants firstly contend that the association, representing and compressing and operations of claim 1, for example, are not merely broadly recited without any tangible way of implementing these operations. For example, the compressing operation is a further qualified by the language "by quantizing each RMBR to a finite precision by cutting off trailing insignificant bits after quantization", which clearly specifies a manner in which the compression operation is to be performed. With respect to the associating operation, a person skilled in the art would readily appreciate many ways in which such an association operation may be performed, and the Applicants do not intend to limit claim 1 or claim 12 to any one of these association operations in

particular. Similarly, any person skilled in the art would really appreciate many ways in which paid a representation may be performed were achieved, and the Applicants again do not intend to limit claimed 1 or claim 12 to any one of the use representation operations in particular.

Further, the methods claimed in claims 1 and 12 may have a practical application, merely for example, when the method is used to provide data structures in a computerized database system to enhance its performance. For example, by using the method claimed in claims 1 and 12, a main memory database system, especially using multi-dimensional indexes may be able to reduce index search time.

Also, it is clear that Applicant's invention claimed in claims 1 and 12 , in example embodiments, may be used to provide a cache-conscious data structure that can be employed by a computerized database system. The computer-implemented data structure is a concrete, useful and tangible result from example embodiments of inventions claimed in claims 1 and 12.

§102 Rejection of the Claims

Claims 1-2, 6-9, 11-14 and 16 were rejected under 35 U.S.C. § 102(e) for anticipation by Kothuri et al. (U.S. 6,470,344).

To anticipate a claim, the reference must teach every element of the claim. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).* It is not enough, however, that the prior art reference discloses all the claimed elements in isolation. Rather, "[a]nticipation requires the presence in a single prior reference disclosure of each and every element of the claimed invention, *arranged as in the claim.*" *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984) (citing *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 220 USPQ 193 (Fed. Cir. 1983)) (emphasis added).

Applicants respectfully submit that the Office Action did not make out a *prima facie* case of anticipation for the reason that Kothuri does not disclose each and every claim element (or limitation) of the independent claims of the present application.

Kothuri describes a method for buffering nodes of a hierarchical index (e.g., R-tree, bang file, hB-tree) during operations on multi-dimensional data represented by the hierarchical index.

Although Kothuri describes using a R-tree that employs MBAs (Minimum Boundary Area) to manipulate data rectangles in a multi-dimensional database, Kothuri does not disclose at least the below discussed limitations of the independent claims of the present application.

First of all, the Office Action argues that Kothuri teaches representing each of one or more said MBRs by a relative representation of an MBR (RMBR). As a support of this, the Office Action points to Figures 3, 6A and column 11, lines 47~53 of Kothuri.

The portions of Kothuri cited by the Office Action describe a VAMSplit algorithm where a set of two-dimensional data points is divided to create an R-tree index. Although the cited portions state that the x- and y-axes may represent any suitable indicia, such as latitude and longitude, color and intensity, etc., the cited portions do not disclose a specific way of representing MBRs by using an RMBR that is the coordinates of the MBR represented relative to the coordinates of a reference MBR as claimed in claims 1 of the present application.

For example, under Kothuri's approach, there is no designated reference MBR based on which the relative coordinates of other MBRs are calculated. Consequently, other MBRs are not represented in the coordinates relative to the reference MBR. Although Kothuri states that numerals are used to represent to each of the clusters or data items in it (e.g. 302a, 320, 322, 324 and 326 in Fig. 3 and 6A, Col. 11, line 55), Kothuri does not disclose that they are relative coordinates calculated based on a coordinate of a reference MBR as claimed in claim 1 of the present application.

Likewise, the numbers used in "m(11), m(5) and m(6)" in Fig. 3 of Kothuri are not relative coordinates based on the reference MBR. Unlike the Office Action's assumption, "m(11), m(5) and m(6)" are just symbolic representations of "Dividing Lines" (e.g.,310, 312 and 314 in Fig. 3) where a data split occurs under the VAMSplit algorithm. Specifically, "m(N)" represent an approximate median [number] when there are N data points in a DATASET (300) (col. 11, lines 56~63).

For example, m(11) just represents a median value for a dataset having eleven data points. The median value of six for this example is calculated by the given formula (col. 11, line 63 ~ col. 12, line 11) and is used to indicate a first dividing line. Using this median value of six

as an indication of the dividing line, the first given set including eleven data points are split resulting in two groups having six and five data points respectively.

Then, m(6) represents a median value for the newly split part of the dataset having six data points (left side of the dataset 300 in Fig. 3). For this time, the median value of three is calculated using the same formula above and the already-split part having six data points splits again into other two data groups having three and three data points. And so on (col. 12, lines 12~62). Kothuri, therefore, does not disclose using a relative MBR (RMBR) to represent a MBR, as claimed in claim 1 of the present application.

Furthermore, Kothuri does not disclose compressing each RMBR into a quantized RMBR (QRMBR) as claimed in claim 1 of the present application. As support for the assertion that Kothuri illustrates an equivalent process of compressing RMBRs, the Office Action points to col. lines 60~67 and col. 12, lines 1~62.

The cited portion of Kothuri describes the process for dividing data points using a median value for the given number of data points in a dataset as an indication of the dividing lines as discussed above. The cited portion, however, does not disclose compressing each RMBR into a QRMBR by cutting off trailing insignificant bits after quantization, as required by claim 1.

The arguments presented above with respect to claim 1 are also applicable to a consideration of independent claim 12, and the Examiner is respectfully requested to consider these arguments in connection with claim 12.

Kothuri, therefore, does not disclose each and every limitation of either claim 1 or claim 12 of the present application. Reconsideration is respectfully requested.

With regard to dependent claims 2-11 and 13-16 , these claims are patentable as being dependent on a patentable base claim.

In addition, at least the following arguments apply with respect to the dependent claims:

Kothuri does not teach or suggest using internal nodes having a pointer only for the first entry as claimed in claims 6 and 13;

Kothuri does not teach or suggest storing a reference MBR in each node as claimed in claim 7; and

Kothuri does not teach or suggest using the corresponding QRMBR ("quantized representation" in claim 14) stored in a parent node to obtain the reference MBR ("minimum bounding shape" in claim 14) of a child node of the parent node as claimed in claim 8 (claim 14); and

Kothuri does not teach or suggest storing QRMBR in the internal nodes while storing MBRs in the leaf nodes as claimed in claim 9.

§103 Rejection of the Claims

Claims 3-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kothuri as applied to claim 1 above, and further in view of Fortin et al. (U.S. 6,868,410).

Claims 3-5 are, however, patentable as being dependent on a patentable base claim.

Claim 10 and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kothuri as applied to claim 1 and 12 above respectively, and further in view of "Compacting Discriminator Information for Spatial Trees by Inga Sitzmann and Peter J. Stuckey, Copyright 2001, Australian Computer Society, Inc.

Claim 10 and 15 are, however, patentable as being dependent on a patentable base claim.

CONCLUSION

Applicants respectfully submit that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at 408-278-4042 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

By their Representatives,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop Petitions, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 31 day of August 2006.

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Name — Signature